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ABSTRACT

The report provides an overview of distance education, as developed by a task force for the American Mathematical Association of Two-Year Colleges. The report presents the history of distance learning and views supporting it, and identifies students who can benefit from distance education. It discusses mediums for distance learning, such as print, audio teleconferencing, radio, audiocassettes, audiographic teleconferencing, video, videoconferencing, videocassettes, computers, on-line options, multimedia and interactive options, and CU-SeeMe. The report states that the role of the teacher in distance learning is to cultivate the students' ability to learn while students set their own goals. Students themselves must be strongly motivated and self-disciplined. A real barrier to distance learning is a financial one as the need grows for equipment, training, and incentives. It concludes that assessment should provide a clear vision concerning the performance of distance learning students as institutions "get on the band wagon" of distance education. The report includes an outline of who distance education learners are, how a distance learning course is the same as or different from a classroom course, distance learning student needs, difficulties faced by distance education students and teachers, possible characteristics of the successful distance education teacher and student, additional thoughts on distance education, and the next steps. (Contains 21 references.) (VWC)

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Distance Learning Task Force Report

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Distance Learning Report

Diversity in the educational requirements of students and a shift in the campus climate have made distance learning a desired method of instructional delivery. Virtual universities are taking shape that link students and faculty electronically; the potential growth of such institutions is unlimited (National Research Council, 1996). The role of faculty is shifting from that of a lecturer to that of a facilitator of learning (Hancock and Betts, 1994; National Research Council, 1996; Dixon, 1996) and many college administrators are supportive of distance learning. These concepts have driven the use of alternative methods of instruction throughout the nation.

Introduction

For education to be effective, the learner must be able to access the delivery system easily, quickly, and conveniently. The pedagogy must be individualized, customized, modularized, and contextualized. The outcomes must include program completion, high levels of skills acquisition, values which unite and civilize, and a high level of satisfaction (Mingle, 1995).

Any educational institution using a wide range of technology to enable the student to break out of the time and space barriers traditionally associated with learning and studying is referred to as a virtual college (Dixon, 1996). The design of its learning system should meet and/or exceed the needs of the individual student. New modes that will deliver unexplored environments of learning should be constructed based on the knowledge of what one desires for ones students (Serim, 1997). The curriculum of the virtual college is composed of specific courses which involve the interaction between the learner and the instructor, among learners and/or between learners and learning resources conducted through one or more media; the use of electronic media is not necessarily required (American Council of Education, 1996).

The Need For Distance Learning

According to Dolence and Norris (1995), in the last three years 20 million plus full time equivalent (FTE) learners seek educational opportunities. Studies show that in order for individuals to keep their jobs, they will need the equivalent of 30 credit hours. Using labor statistics, this means that an additional 672 campuses with an enrollment of 30,000 students will be needed. Will higher education have an exclusive claim on the education of these individuals? The global economy requires a highly educated workforce to be competitive (Hannum, 1996; Peachy, 1996). Distance learning holds definite possibilities. For employees who need additional schooling, distance education provides flexible formats and scheduling.

Since the late 1970's the use of home schooling has grown from fewer than 13,000 students to an estimated 1.2 million students (Sharp, 1997). These students do not see the inside of a traditional classroom but rather are educated at home. While home schooling is legal in every state (Home School Legal Defense Association, 1997), there remains a question about the educational background of the teachers who may have no formal teaching training. These students could benefit from a distance learning approach.

History of Distance Learning

Many institutions have been involved with distance education for quite some time. For instance, Sinclair Community College in Dayton, Ohio with a student body of 21,000 students first began distance learning in 1979 through the use of telecourses. In 1996, Sinclair offered 70 different telecourses with over 7,500 enrollments for the year. Northwestern Michigan College, a rural college with an enrollment of approximately 4,000 students, introduced distance learning with a single telecourse in 1982. San Diego City College began telecourses in 1968. The University of Toledo hired a director of distance learning in 1995. Terra Community College appointed a coordinator of distance learning in 1994 and produced three distance learning courses which were integrated into the curriculum in the winter quarter of 1996. Terra will offer 20 distance learning courses in Winter, 2000.

East Knox and Gahanna Jefferson High Schools in Columbus, Ohio are involved in a multifaceted study using distance learning technologies to provide cooperative support for teaching learning, and effective technologies uses between peers -- teachers and students. The project goals are 1) to create opportunities for teachers and students to integrate technology into daily classroom activities; 2) to create a support system between schools for effective design and assessment as well as technical problem solving; 3) to stimulate and encourage students to produce in-depth projects using technology while ensuring equal access of technology for all students; and 4) to stimulate projects between students and teachers from other schools (Whiteman and Paxton, 1995).

Institutions are able to obtain nearly all of the scholarly journals published Johns Hopkins University Press through the Internet and save about ten percent of the cost (On Line, 1997). Students and faculty members alike are able to access these journals from their own homes without stepping foot inside the library which will change the way scholars research according to Ellen M. Sauer, project manager.

Personal Views Supporting Distance Learning

In order to give a broad prospective of distance learning, personal comments made by Dr. Frank Horton, Past President of the University of Toledo; Dr. Larry Johnson, past Associate Director of Technology at the League of Innovation; and Kathy Burgis, faculty member at Lansing Community College are included in this report.

Dr. Frank Horton, President of the University of Toledo, spoke on his views on technology: "I think it's great! The institution is going to be a part of distance learning with all of its facets or it is going to die." He said the University of Toledo (UT) is in a competition -- not just with Bowling Green University, Owens Community College, or Terra Community College, but with everyone in the world. He believes that if UT relies only on Ohio students, 18 year-old students, commuter students, or students in the residence halls, "we are signing our death warrant."

Dr. Horton said that he believes that technology and distance learning will have a "major, major, major impact on universities and community colleges." He believes that the income generated by distance learning will be the driving force. According to the Bureau of the Census, Ohio will experience a 3% growth between now and 2025. This is due to an aging population and people moving out of Ohio. He believes that although many people are frightened, over time it (distance learning) will happen. He believes that

there will always be traditional students but smaller liberal arts colleges will have a hard time. Dr. Horton concluded by saying "Either get into it, or watch it happen to you!"

Dr. Larry Johnson, Past Director of Technology at the League of Innovation and President of Fox Valley Community College believes that technology in the classroom has two primary roles: 1) to add vibrancy and immediacy to the material presented, such as the use of computer simulation in a physics class to conduct a virtual experiment in quantum mechanics that could not otherwise have been done without equipment most colleges do not have, or to make the topic more compelling, as in the use of multimedia to illustrate a segment on the writings of Martin Luther King; and 2) to expose students to and give them experience with tools they will use in their fields, such as the use of Maple or Mathematica in a calculus class to solve a differential equation and graph the result, or the use of a computer to analyze a circuit in an electronic class. In both cases, the technology allows the classroom experience to go beyond lecture, discussion, and text, to add realism to the material.

Kathy Burgis, a faculty member at Lansing Community College, teaches an Internet class. She believes that a major issue of distance learning is student retention. Learning by distance learning is a form of asynchronous instruction (characterized according to Lever-Duffy [1996] by intermittent, as-needed communications conducted from any location at times chosen by individual students and the faculty member). Student work when they feel like it. It is easy for students to put off their work, since they do not have the teacher in class. At Lansing, asynchronous instruction is used for developmental mathematics classes. There is a retention problem in these classes. Ms. Burgis states that research shows that students continue in a class for two reasons, either they are interested in the subject matter or they come because of social contacts. She believes that a fundamental issue to contend with in "web-izing" should be determining a way to create a cohesive "classroom". She said that the most successful distance-educators are concerned with the distance students' progress -- they send letters and make phone calls to keep students on track.

Students Who Can Benefit From Distance Learning

Distance learning brings education to a group of potential students who otherwise may not be able to attend a traditional class. Distance learning students may be full or part time workers, live in a remote or winter-bound area, be home-bound because of family commitments (commonly a single mother), be in the military, be inmates in prison, travel frequently, or be physically challenged. For success, students should be motivated, self-disciplined, possess good study habits, be self-starters, be able to work well without supervision, and good readers. Students who frequently communicate with their teacher do the best in distance learning classes (Dixon, 1996; Case and Brabec, 1996).

Mediums for Distance Learning

There are many types of distance learning. They include print, audio teleconferencing, radio, audiocassettes, audiographic teleconferencing, video, videoconferencing, videocassettes, computers, on-line options, multimedia and interactive options, and CU-SeeMe. Many institutions use a combination of these to create a sound learning environment. The learning may be synchronous or asynchronous.

Synchronous learning occurs when the communication that occurs between the students or student and teacher is at the same time, although not necessarily in the same place. Asynchronous learning occurs when the teacher and the student do not communicate at the same time.

Print forms the basis of all types of distance learning since all distance learning courses include a print component. It communicates specific, factual information. Printed material may include workbooks, study guides, and/or course outlines. Most courses benefit from some type of print component. An estimated 93 percent of distance learning in North American colleges and universities use e-mail as a distance learning medium, while 57 percent use e-mail in conjunction with the world wide web, according to a study published by Primary Research Group (1999). Some advantages of using print-based materials are: materials are using in an asynchronous way by the learner; printed material are easily handled, transported, and warehoused; it is a relatively inexpensive method of delivery.

Audio Teleconferencing uses the telephone to connect two or more people at one time. Although unsuited to courses that require hands-on laboratory work, this medium is an effective means of instruction since students are able to ask questions and receive immediate feedback, get support, and establish a good pace of instruction.

According to Verduin and Clark (1991), radio can be used as a replacement for print by students with low literacy rates. Its accessibility is easy and its costs are low. Radio signals can be sent either live or from a prerecorded program. Although used seldom in the United States, it is a popular form of distance learning overseas (Dixon, 1996) particularly in the Australian outback.

Audiocassettes in the form of prerecorded tapes of instruction, work well when a small number of students wish to enroll in a certain course. At Terra Community College, students may take shorthand using this method of instruction and will be able to enroll in a marketing class in the fall of 1997, which makes use of this medium.

Audiographic Teleconferencing, a type of audio-based technology, uses phone lines to transmit visual information. Examples are facsimile (fax) machines, electronic blackboards, telewriters and electronic pens, slow scan or freeze frame video or compressed video.

Video is one of the most-used mediums today (Dixon, 1996; Lever-Duffy, et al, 1996). Video can be transmitted lived or taped via radio frequencies, telephone lines, coaxial cable, fiber optic lines, satellite, and microwave. The student may also view a video at home using a videocassette player. In 1996, of the approximately 3,300 accredited colleges and universities in the United States, 1,997 offered courses delivered through the Public Broadcasting System (PBS) (Dixon, 1996)

When full-motion, full-color systems send one or two way signals through satellite, fiber optic, or coaxial lines, videoconferencing is taking place. It is common to see videoconferencing on the nightly news. Most frequently, the audio portion of the videoconference is transmitted via telephone lines while the video is transmitted through satellite technology.). Studies have indicated that the farther from campus a student lives, the more favorably he or she evaluates televised courses (Shaheen, 1998).

In the past, students not wanting to leave home enrolled in correspondence courses. Today the communication technology allows students to gain access to information from through their home computers. Computers are used to deliver

instruction, communicate asynchronously, for research and for study. There are several options that can be used with computers: on-line options and multimedia and interactive options. Teachers must "rise to the highest levels of individualized learning, in order to allow their students to reach similarly high standards, and on-line environments, for the first time in human history, make possible the types of mentorship that will be needed." (Serim, 1997). Brandon Hall (1996), in a study of the use of multimedia technology in American corporations, schools, and universities, concluded that, in comparison with traditional instruction, this technology reduced training costs and time, and provided equal or higher quality of learning. Price Waterhouse reported that learning with multimedia was twice as fast as learning with traditional instruction (Hannum, 1996).

CU-See Me is a free, Internet-based videoconferencing program. Anyone with a computer, a modem, and a Web-type connection can videoconference with other people who also have CU-SeeMe and a Web connection. Lakeland Community College has asked other institutions via the Internet to take part in Mathematics Awareness Week with them during the spring of 1997 through this medium.

Learning

The Role of the Teacher in Distance Learning

Students value the human element in their education and will not willingly relinquish that element (National Research Council, 1996.) Teachers will play a variety of roles: when students are dependent learners, the teacher is the coach; when students are interested learners, the teacher motivates and guides; when students are involved learners, the teacher facilitates; when students are self-directed learners, the teacher is a consultant. Learners set their own goals and standards while the teacher cultivates the students' ability to learn (Grow, 1996). The ultimate goal of distance learning is to make students self-directed learners.

The Role of the Student in Distance Learning

Like students who attend on-campus classes, students enrolled in distance learning classes must attend classes regularly, participate and interact in class activities, and turn in course assignments on time. The student must be strongly motivated and be self-disciplined. The students must contact the teacher if they are having difficulties.

Barriers to Distance Learning

A real barrier to distance learning is a financial one (Peachy, 1996). Faculty members who wish to increase their use of information technologies need equipment, training, and incentives (National Research Council, 1996; League of Innovation, 1996; Green, 1996). This equipment is expensive and it is not a one-time expense. Data indicates that "almost three-fourths of American colleges and universities do not have a financial plan to 'acquire and retire' technology resources; rather, most technology purchasing is largely opportunistic, often done with 'budget dust' at the end of the fiscal year." (Green, 1996).

Conclusion

As institutions "get on the band wagon" of distance learning, they must remember the final step in education -- that of assessment. The assessment should provide a clear vision concerning the performance of distance learning students. The Schubert cycle of Plan-Do-Study-Act should constantly be enforced.

Care should be taken in the planning cycle of the distance learning course. Teachers must be properly trained to use technology. They must be trained to act as a coach rather than an "information dispenser." Materials should be provided to students to make the learning experience an enriching one. The technology selected should be fully accessible and understandable to students. Learning activities should be organized around demonstrable learning outcomes. During the Do cycle, the teacher should assist students in achieving the prescribed learning outcomes while remaining in constant contact with them through personal interviews, phone calls, mail, email, or fax. Students should be provided with technical support when necessary. They should be fully informed of the expectations and qualifications of the distance learning course. An orientation session for students may be necessary.

Once the students have concluded their course work, an accurate assessment should take place. Each aspect of the course should be examined to determine where improvement could take place to ensure currency and effectiveness. The assessment of student learning should be timely and appropriate and responsive to the needs of the students. The learning outcomes of the course should be evaluated to determined if they are relevant to the students, to the course, and to the method of delivery of the course.

As the diverse student body continues to demand up-to-date methods of delivery, distance learning will persist as a desired method of instructional delivery. Research indicates that not all students can benefit from distance learning since student performance depends heavily on the way students are selected and the way the courses are presented and facilitated. The potential growth of institutions offering distance learning is tremendous. Through distance learning, schools can provide students with learning opportunities that may not have previously existed. The future colleges of tomorrow may be colleges without place and without time -- the future is unlimited!

Who are the Distance Education Learners?

Students . . .

- For whom this is the only reasonable way they can continue their education.
- Who are at home with small children.
- Whose work schedule does not allow them to attend class regularly.
- Who are self-motivated, self-disciplined, and posses good study habits.
- Who work well without supervision and are not afraid to seek direction when necessary.
- With good reading comprehension skills.
- With physical or psychological hardships.
- In correctional institutions.
- Who feel they don't want to go to class.
- Who wish to enroll in unusual classes.
- Who wish to enroll in supplemental classes.
- Who wish to accelerate their program of study.
- Who move to a different city/town/state.
- Who have to travel great distances to attend class.
- Who are dually enrolled in high school and college.

How is a distance learning course the same as a classroom course?

In each case . . .

- Course standards, content and outcomes are identical.
- Assessment of learning should be equivalent.
- Student should be actively engaged.
- The use of the web can augment the class. There should be no distinction between who uses the web for resources.
- Distance learning courses require at least as much time as on-campus courses for both teacher and student.

How can a distance learning course be different than a classroom course?

In a distance learning course . . .

- Teachers may or may not receive verbal or visual cues from their students.
- Modern technology is used to teach concepts, and to enable students to communicate with the teacher and/or other distance learning students.
- Classes may be flexibly scheduled. Students set their own hours.
- Print materials may be the primary source of directions and information.
- Faculty workload may be greater.
- Students may not physically be in the same place but could be "present" at the same time.
- Greater self-discipline demands.
- Greater self-motivation demands.
- Diversity of models (i.e. synchronous vs. asynchronous).
- Different forms of interaction/communications exist.
- Teachers must anticipate questions from students.
- Students may participate more (or less).

Needs of the distance learning student

The student should have . . .

- Institutional information that includes fee structures, policies for students studying at a distance, and pre-class information, including a brief description of technology to be utilized.
- Administrative information that includes information about admissions, advising, registration, and textbooks as well as personnel contact list for main campus and remote sites.
- Academic information that includes an expanded course syllabus, grading policies, and deadlines.
- Access to appropriate technology, competency in use of this technology and technology support.
- Access to student services.
- Access to support systems (such as tutoring).
- Knowledge of how to communicate with instructor and/or classmates.
- Flexibility of expectations and temperament.
- "In-Person" meet times available with instructor.
- Up-front expectations and/or explanation of distance learning course(s).
- Knowledge of his/her own learning style and success of student with this learning style in distance learning course.
- Same class size as a traditional class (if not smaller).
- Counselor fluent in advising of distance learning courses.

Difficulties Faced by Students

Students . . .

- Need to know where to go for help and be persistent in their quest.
- Need to ask very specific questions, isolating what their problem is by creating the context, and identifying the specific moment where they became confused.
- Must be proficient in reading texts for meaning.
- May easily fall behind in their work.
- May not "participate in class discussions" because of lack of knowledge of technology.
- May not be computer literate or have access to a computer.
- May experience computer crashes.
- Have a variety of learning styles and distance learning may not fit their style.
- May not have adequate student support (counseling, financial aid, etc.) available to them via the Internet or other "long distance" means.
- May not be successful in any distance learning course by nature of course presentation.
- May not receive adequate feedback in a timely fashion.
- May be camera shy and not want to "be on TV."
- May be confused by bank of television screens.
- May experience "seasickness" due to the movement of faculty and/or students on the television screen.
- May lack readily available methodology to express questions (i.e. mathematics symbols.)

Difficulties Faced by Teachers

Teachers . . .

- Must have a high degree of technical knowledge to teach television course.
- May not understand the limitations and strengths of the technology being used.
- Must have a high degree of computer literacy in many cases.
- Must determine which technology is most appropriate for the content being delivered.
- Must revamp course syllabus to include all of the information necessary for the distance learning student.
- May lack experience in answering questions succinctly through electronic means.
- May find answering questions difficult when having to write out the entire explanation.
- May lack support services.
- May be faced with dilemma of how to teach higher order reasoning at a distance.
- May be faced with administrators who do not care about sound educational practices but rather how to make more money.
- May find it difficult to contact and/or work with students with make-up work or incompletes.
- May miss the spontaneity and excitement of a class discovering a concept with a teaching guiding them that takes place in a traditional classroom.
- May accumulate an unmanageable amount of email that can be quickly generated by just a few students.
- May have difficulty communication mathematical symbols.
- May not be successful in a distance learning environment.
- May experience a lack of understanding or experience by administrators and others (teachers and students.)
- May have difficulty ensuring academic integrity.
- May not have knowledge of copyright laws as they apply to distance education.
- May have unrealistic time expectations.
- May have difficulty creating hands-on activities to be used in distance classes.

Possible characteristics of the successful distance education teacher

The teacher may. . .

- Communicate frequently with the class (through email, chat rooms, listserves, web sites, telephone, on-campus visits, virtual office hours, voice mail, U.S. mail, fax, etc.)
- Create as much interaction of students with fellow students as possible.
- Use the simplest tool that he/she can for the purpose he/she wants to achieve.
- Meet the needs of the individual desiring to learn with the learning delivery system best suited to the circumstances of that individual.
- Never attempt to replace the classroom teacher.
- Avoid teaching large class sizes.
- Be paid appropriate compensation for developing distance learning courses.
- Participate voluntarily in distance education.
- Use distance education not as a replacement of the classroom but as an alternative mode of delivery to meet the needs not currently met.

- Have a good knowledge of appropriate instructional design knowing the strengths and the limitations of each medium.
- Use modes of delivery which provide learning opportunities that do not compromise any content or quality.
- Provide the education students need with the quality it should have and the desired flexibility that the student requires.
- Open doors and explore new avenues of instruction that will carry over into the traditional classroom.
- Be properly trained and be provided support.
- Have flexible office hours (these may be virtual).
- Have accounting in both directions.
- Be able to live in the past, the present and the future simultaneously.

Possible characteristics of the successful distance education student

The student may

- Familiarize himself/herself with the course design.
- Read the entire course syllabus.
- Identify tools necessary to complete assignments.
- Be realistic.
- Set interim goals and deadlines for themselves and stick to them.
- Organize his/her goals in a study schedule.
- Avoid interruptions.
- Know where/when to study.
- Stay in touch with his/her instructor.
- Prepare for assignments and tests.
- Use good communication skills.
- Evaluate his/her own progress regularly.
- Time his/her test wisely.
- Find some study-buddies.
- Discuss his/her progress with teacher.
- Use relaxation techniques for better focus.
- Have prerequisite skills for the class.
- Practice good manners at distance learning sites.
- Be assertive.

Additional thoughts on Distance Education

- The decision by a faculty member not to be involved with distance education should not be negatively evaluated.
- The use of distance education should not be intended to reduce or eliminate course offerings of the college but to offer another alternative to the students.
- Faculty, professional staff members, and the colleges should retain the same proprietary interests and rights over course materials for distance education courses as they have under the applicable state and federal law.
- There are hidden costs for distance learning instructors (phone lines, upgrades of equipment, software, hardware, printer ink, printer paper, postage, etc.)
- Education should be about learning how to interact with student peers in learning how to learn, not just obtain information.
- Even though they are no measured differences in achievement between traditional delivery methods and distance education, adults seem to prefer face-to-face teachers when given a choice.
- Methods that work well in the classroom may not work in distance education classes.
- Distance education directly supports the delivery of certificate programs, associate degree programs and transfer programs that prepare students for productive careers.
- Distance education facilitates lifelong learning in response to the needs of the students both locally and regionally.
- Distance education makes education accessible to the local and regional community for whom traditional delivery method is not a viable option.
- The development of exemplary distance education programs requires careful planning, with special attention directed to the needs of students and faculty.
- Institutions can share their resources to meet student needs.
- Distance education should have sufficient opportunities for in person student-student and student-professor interactions, not necessarily on campus.
- Practitioners must be scrupulously honest in their portrayal of opportunities and benefits of distance education programs.
- Students do not learn from the technology; they learn from competent teachers who teach through the technology.
- Group work and discussions can be accomplished when well-planned and developed.
- Administrators and faculty alike should support research in mathematics taught at a distance.

Next Steps

Distance education has become an important topic on a multitude of levels in the community colleges, not only for faculty, but also for administration. Decisions made within various institutions will have far reaching implications in the mathematical education of community college students. Since the issue of distance education is one that is changing rapidly; many questions arise. Many institutions look upon AMATYC for

guidance in the decision making process therefore it is imperative that AMATYC develop guidelines for distance education after a thorough study of best practices and further research has taken place. These guidelines should follow the Crossroads in its pedagogical ideas and could be presented to the AMATYC membership through a position paper. The distance learning task force recommends that a permanent distance learning committee be developed to develop the position paper. This committee should have representation for each and every academic committee of AMATYC.

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